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## Ketosis

Dr Robert Atkins views **ketosis** as a "metabolic advantage" to weight loss, which it is. I'm of normal weight with a Body Mass Index just under 25 (over 25 is a worry), and the advantage of **ketosis** for me is the stability and ease of control it confers on my blood sugar, the protection from hypoglycemia it affords (because almost all tissues can burn ketones as well as glucose), and the fact it improves my "hypoglycemic awareness" - I know when I'm "low."

Briefly, the body naturally turns to fat for fuel when carbohydrate isn't available. When a lot of fat is burned, some of the fat fragments - ketones - get excreted to preserve the body's acid-base balance (because ketones are acid), and this called "**ketosis**." The excreted ketones have about 5 calories per gram, and since you can excrete quite a lot of ketones, this confers Atkins' "metabolic advantage."

### Let's look at ketosis in more detail:

- When my blood sugar drops after a low-carbohydrate meal, the hormone glucagon is released which causes triglycerides to be released from my body's store of fat. Glucagon also causes the liver to break the triglycerides into glycerol and free fatty acids ...
- The glycerol part of the triglyceride provides about 7% of the fat calories as glucose, but this is not enough to maintain my blood sugar level. The balance comes from the breakdown of protein from the food I've eaten.
- Meanwhile, the free fatty acids are cut into two- and four-carbon fragments called ketones or ketone bodies. Ketones are normally present in the bloodstream, but when their concentration exceeds 70 mg/dl, they start to appear in the urine - this is "**ketosis**."
- Ketone bodies are the preferred fuel of the **heart**, adrenal cortex, skeletal musculature and parts of the brain; these tissues actually prefer to burn ketones, which conserves blood sugar (from refs in Eades & Eades, *Protein Power*, Bantam, 1998, p. 149)
- Excess ketones are excreted in the breath, stool and urine, mostly in the urine. Test strips passed through the urine stream reveal their concentration. I use Ketodistix which also show the level of sugar in the urine because I want to distinguish between normal **ketosis** and diabetic ketoacidosis - this happens when a diabetic takes too little insulin and the resulting combination of very high blood sugar plus very high ketones can cause coma and death.
- Trace to moderate ketones a few hours after a meal means I'm burning my fat reserves and/or recently-eaten fat for energy between meals in a normal process of metabolism. I'm excreting the ketones which are in excess of my energy requirements to maintain a physiological acid/base balance (ketones are acidic).
- Since I'm getting rid of unburned fragments of fat during this **ketosis**, I'm only getting maybe 5 calories per gram from the fat I eat. I can therefore eat more fat without putting on weight, or I can

lose weight without having to burn it off through muscular exertion. Fat provides 3500 calories per pound, so losing a pound means a lot of exercise. If I want to lose weight, I cut back on carbo; and if I wanted to gain weight - fat chance! - the experience of a lifetime suggests that all I have to do eat more carbs.

- "Large ketones" means fatigue, headaches and sometimes nausea for me. If my blood sugar is normal, I take this to mean that I've eaten too little carbohydrate. Acetone is a ketone, so my breath has that "hungry person" smell when the test strips show large ketones.
- **Ketosis** on liquid protein diets - low-fat, high-protein diets - caused deaths from **heart failure** because protein from the **heart** muscle was used for blood sugar. I actually have to make an effort to eat enough fat to make this way of eating work for me! I have lost only fat, not muscle mass, but I'm sure that if I ate too little fat or too few calories while in **ketosis**, I would lose muscle.
- **Ketosis** masks appetite in the sense that I don't crave food. I'm hungry when my blood sugar is low and I need food. This may sound like the most natural thing in the world, but for an insulin dependent diabetic, this is like winning the lottery. I have my blood sugar, my weight and my appetite under control. It's like a miracle. As a bonus, **ketosis** protects against insulin reactions. I hope to live on the cusp of **ketosis** for the rest of my days.

How does one enter **ketosis**? I cut out all refined carbohydrate and used smaller and smaller quantities of low-glycemic index carbs like creamed spinach, steamed asparagus and broccoli until the Ketodiastix indicated ketones. Then kept my carb intake near this critical percentage, which is about 5-10% of calories for me. It took a violent shift in attitude to eat enough fat to make this work. The payoff in terms of diabetic control and mood stability are simply incredible. The years of searching for an answer to the frustrations of insulin dependence have not been wasted.

### Those Unfamiliar with Ketosis Fear that it is Dangerous

"Liquid Protein" diets like the Cambridge diet introduced after publication of *The Last Chance Diet* (1976) killed at least fifty people whose hearts failed through fibrillation. This very low calorie, low fat diet caused people to lose muscle mass everywhere, including the **heart** which eventually gave up. The Food and Drug Administration warned the medical community about the danger of this kind of diet which gave **ketosis** a bad name.

The nutritionists and diet advisors listened. Jane Brody said ketones are toxic Stuart Berger bashed them in *How To Be Your Own Nutritionist*. Ann Louise Gittleman writes in *Your Body Knows Best*:

Without some carbohydrates to maintain blood sugar levels and fuel the system, ketone bodies - fatty substances generated from the breakdown of stored fats or triglycerides - are soon formed in the blood. Ketone bodies mask your appetite even though your brain demands glucose. The result is **ketosis**: headaches, light-headedness, and mental fatigue. Eventually, [on a low fat diet] your body will begin to convert protein from your muscles into blood sugar. You lose weight, but it is from muscle mass, not from fat. (Pocket Books, 1997)

None of this is true in my experience on a low carbohydrate diet without caloric restriction. I'd bet a buck that these guys haven't personally experienced moderate **ketosis** on a low carbohydrate diet without caloric restriction. It is well established that **ketosis** is part of the normal metabolism, and that ketones can supply up to 90% of energy, with the brain fulfilling about 2/3 rds of its energy requirement with ketones and the rest with glucose (Barnes RH et al, *J Biol Chem*, 1939;131:413-23).

I feel well nourished. My mood is more stable. My appetite is linked more tightly to my blood sugar

level, so I don't have the "hypoglycemic unawareness" which sends most insulin-dependent diabetics to the emergency room sooner or later. I reach for a snack, but only when I need one; and I'm losing the weight I need to lose slowly, which is good.

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